

AMENDMENT TO THE CLAIMS:

This listing of claims will replace all prior versions of claims in the application:

LISTING OF CLAIMS:

1. (ORIGINAL) A magnetic head, comprising:
a sensor having a free layer, the free layer having a magnetic moment;
hard bias layers positioned towards opposite track edges of the sensor, the bias
layers stabilizing the magnetic moment of the free layer;
an antiparallel (AP) pinned layer structure positioned toward each of the hard
bias layers, each AP pinned layer structure having at least two pinned
layers having magnetic moments that are self-pinned antiparallel to each
other, each AP pinned layer structure stabilizing a magnetic moment of
the hard bias layer closest thereto; and
an antiferromagnetic layer positioned toward each of the AP pinned layer
structures, each antiferromagnetic layer stabilizing a magnetic moment of
the pinned layer closest thereto.
2. (ORIGINAL) A head as recited in claim 1, wherein the hard bias layers each
include at least Co.
3. (ORIGINAL) A head as recited in claim 2, wherein the hard bias layers are
constructed from a material selected from a group consisting of CoPt and
CoPtCr.
4. (ORIGINAL) A head as recited in claim 1, wherein the antiferromagnetic layers
each include at least PtMn.

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5. (ORIGINAL) A head as recited in claim 1, wherein the pinned layers of the AP pinned layer structure each include at least Co, wherein the pinned layers are separated by a layer of Ru.
6. (ORIGINAL) A head as recited in claim 5, wherein the antiferromagnetic layers are constructed from PtMn.
7. (ORIGINAL) A head as recited in claim 1, wherein the pinned layers of the AP pinned layer structure each include at least Fe, wherein the pinned layers are separated by a layer of Cr.
8. (ORIGINAL) A head as recited in claim 7, wherein the antiferromagnetic layers are constructed from PtMnCr.
9. (ORIGINAL) A head as recited in claim 1, wherein the AP pinned layer structures are positioned between the hard bias layers and the antiferromagnetic layers.
10. (ORIGINAL) A head as recited in claim 1, wherein a magnetic moment of each pinned layer closest to the associated hard bias layers is oriented parallel to a magnetic moment of the associated hard bias layer.
11. (ORIGINAL) A head as recited in claim 1, wherein the antiferromagnetic layers each have a thickness of at least about 50 Å measured in a direction perpendicular to a plane of the antiferromagnetic layer, wherein each of the pinned layers of the AP pinned layer structures has a thickness less than about 25 Å.

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12. (ORIGINAL) A head as recited in claim 1, wherein the antiferromagnetic layers each have a thickness of at least about 100 Å measured in a direction perpendicular to a plane of the antiferromagnetic layer, wherein each of the pinned layers of the AP pinned layer structures has a thickness less than about 15 Å.
13. (CANCELED)
14. (CANCELED)
15. (ORIGINAL) A head as recited in claim 1, wherein the head forms part of a CIP GMR sensor.
16. (ORIGINAL) A magnetic head, comprising:
a sensor having a free layer, the free layer having a magnetic moment;
hard bias layers positioned towards opposite track edges of the sensor, the bias layers stabilizing the magnetic moment of the free layer, wherein the hard bias layers each include at least Co;
an (AP) pinned layer structure positioned toward each of the hard bias layers, each AP pinned layer structure having at least two pinned layers having magnetic moments that are self-pinned antiparallel to each other, each AP pinned layer structure stabilizing a magnetic moment of the hard bias layer closest thereto; and
an antiferromagnetic layers positioned toward each of the AP pinned layer structures, each antiferromagnetic layer stabilizing a magnetic moment of the pinned layer closest thereto, wherein the antiferromagnetic layers each include at least PtMn;

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wherein an Hc of each of the bias layers is at least two times an Hc of hard bias layers in a structure identical to the head of claim 1 but without antiferromagnetic layers.

17. (ORIGINAL) A head as recited in claim 16, wherein the hard bias layers are constructed from a material selected from a group consisting of CoPt and CoPtCr.
18. (ORIGINAL) A head as recited in claim 16, wherein the pinned layers of the AP pinned layer structure each include at least Co, wherein the pinned layers are separated by a layer of Ru.
19. (ORIGINAL) A head as recited in claim 18, wherein the antiferromagnetic layers are constructed from PtMn.
20. (ORIGINAL) A head as recited in claim 16, wherein the pinned layers of the AP pinned layer structure each include at least Fe, wherein the pinned layers are separated by a layer of Cr.
21. (ORIGINAL) A head as recited in claim 20, wherein the antiferromagnetic layers are constructed from PtMnCr.
22. (ORIGINAL) A head as recited in claim 16, wherein the AP pinned layer structures are positioned between the hard bias layers and the antiferromagnetic layers.
23. (ORIGINAL) A head as recited in claim 16, wherein a magnetic moment of each pinned layer closest to the associated hard bias layers is oriented parallel to a magnetic moment of the associated hard bias layer.

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24. (ORIGINAL) A head as recited in claim 16, wherein the antiferromagnetic layers each have a thickness of at least about 50 Å measured in a direction perpendicular to a plane of the antiferromagnetic layer, wherein each of the pinned layers of the AP pinned layer structures has a thickness less than about 25 Å.
25. (ORIGINAL) A head as recited in claim 16, wherein the antiferromagnetic layers each have a thickness of at least about 100 Å measured in a direction perpendicular to a plane of the antiferromagnetic layer, wherein each of the pinned layers of the AP pinned layer structures has a thickness less than about 15 Å.
26. (CANCELED)
27. (ORIGINAL) A head as recited in claim 16, wherein the head forms part of a CIP GMR sensor.
28. (ORIGINAL) A magnetic storage system, comprising:
magnetic media;
at least one head for reading from and writing to the magnetic media, each head having:
a reading portion having the structure recited in claim 1;
a write element coupled to the sensor;
a slider for supporting the head; and
a control unit coupled to the head for controlling operation of the head.
29. (ORIGINAL) A magnetic storage system, comprising:
magnetic media;

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at least one head for reading from and writing to the magnetic media, each head
having:
a reading portion having the structure recited in claim 16;
a write element coupled to the sensor;
a slider for supporting the head; and
a control unit coupled to the head for controlling operation of the head.

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